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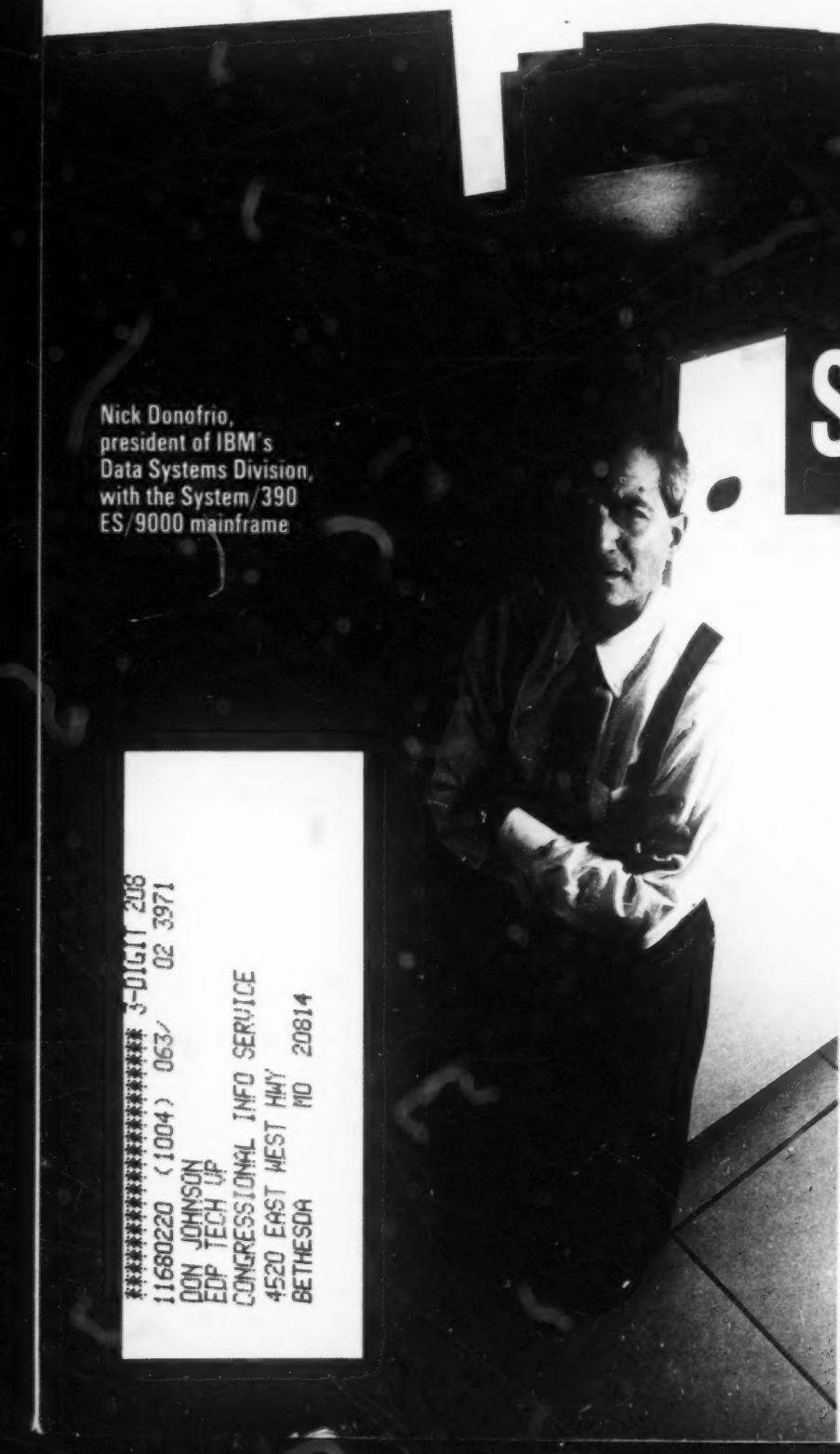
DATAMATION

FOR CORPORATE COMPUTING PROFESSIONALS WORLDWIDE

OCTOBER 1, 1991

Can IBM Realize Its S/390 Vision?

page 30



Nick Donofrio, president of IBM's Data Systems Division, with the System/390 ES/9000 mainframe

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PROJECT MANAGEMENT — OVER 20 PRODUCTS COMPARED — *page 95*

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DATAMATION

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VOLUME 37
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After a rocky transition, the ES/9000 line promises higher performance, lower prices and better reliability.

COVER STORY

MAINFRAMES

Can IBM Realize Its S/390 Vision? 30

BY JEFF MOAD IBM's top of the line ES/9000 model 820 and 900 mainframes are finally shipping. But their ability to play an expanded role as highly parallel managers of enterprise data, applications and systems has yet to be proven.

Cover photography by Alan Orling/BlackStar

SPECIAL REPORT

TOP 50 SOFTWARE COMPANIES

Software's Big 50 58

BY DENNIS HAMILTON AND J. WILLIAM SEMICH
Stunned by the success of Microsoft's Windows 3.0 technology, independent software vendors are working hard to evolve their products to meet users' revolutionary new demands for interoperability, ease of use and standards.

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From Text To Icons 91

BY ELIZABETH LINDHOLM
If you're thinking about cooperative processing, Must Software International says its Flashpoint For Nomad can help developers take the first step.

Must's Murphy: Smoothing out your mainframe applications' front ends can make life easier for users.

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The Rise Of The Superfloppy 39

BY RICK COOK The once-humble 3½-inch floppy is back, bigger and better than ever. IBM's 2.8MB drive looks like a winner, but the more intriguing 20MB models from smaller players could run into a standards roadblock.

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BY BOB FRANCIS Today's pen-based computers are not likely to convince many office workers to abandon their keyboards. But for millions of field workers, the technology is well suited to specialized applications.

Suppliers of pen-based notebooks will first target mobile workers.

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ProTool's Proactive Network Manager 51

BY TOM McCUSKER Protolyzer's data-filtering and simulation capabilities let LAN administrators head off trouble before it shows up on the network.

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VAX Security Gets Tough 71

BY MIKE RICCIUTI After suffering two black eyes, Digital Equipment Corp. is serious about its operating system security. But is it too late for VAX/VMS and ULTRIX users?

SYSTEMS MANAGEMENT

SystemView's New Partners 77

BY LEILA DAVIS Since last year, eight of IBM's original SystemView product partners have dropped by the wayside. IBM says it's working hard to bring them back soon.

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BY NED SNELL New network laser printers are fast and flexible—and that redefines the options for distributed-printing strategies.

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Swifter 2200 Eases Unisys Users' Fears 85

BY ELAINE L. APPLETON In the face of losses and layoffs, Unisys has introduced a new high-end mainframe. And users, who credit Unisys with world-class technology, are welcoming news of the 2200/900, the most powerful 2200 system to date.

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DECUS's Kahle bemoans that DEC systems are frequent targets for hackers, page 71.

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SOFTWARE'S BIG 50

1990

Stunned by the success of Microsoft's Windows 3.0 technology, independent software vendors are working hard to evolve their products to meet users' revolutionary new demands for interoperability, ease of use and standards.

BY DENNIS HAMILTON AND J. WILLIAM SEMICH

The $13 billion-plus in revenue realized last year by the biggest 50 North American independent software companies—along with the tens of billions more in software revenue taken in by major systems companies—testifies to the continued strength of demand for products from the software industry. Despite the recession, IS managers scraped up an extra $3.2 billion to spend on new technologies offered by those top 50 software vendors last year, an increase of 32%.

And no wonder—the new technology is superb, and when it is good, it is very, very good. So why be surprised that it is in great demand?

Take top vendor Microsoft Corp.'s revolutionary new Windows 3.0 technology. After introducing it in April of last year, Microsoft claims to have already shipped some 5 million copies of the easy to use graphical environment. Sales of Windows and Windows-based applications have helped Microsoft leapfrog past behemoth Computer Associates International Inc. to first place in our list of the top 50 independent software vendors this year. Sales at the company grew by an astounding 55% last year. Not bad for an old-line PC software company that's been in the computer business since the 1970s.

The phenomenal reach of Windows technologies into all markets—in the home, among professional power users and in large and small corporate shops—now has users clamoring for more of the same from the rest of the information technology industry. Explains Harriet Schabes, a vice president in the Technology Office of New York City-based Citicorp: "We are joining forces with lots of other end users to demand from our suppliers—both the

DATAMATION's Big 50 Software Companies

RANK 1990	RANK 1989		REVENUE 1990	REVENUE 1989	% CHANGE	1990 R&D	R&D AS % OF REV.	NET INCOME	1990 EMPLOYEES	CIRCLE NO.
1	2	Microsoft Corp.	1,477.8	951.8	55.26%	204.5	13.8%	355.6	6,700	405
2	1	Computer Associates International Inc.	1,310.7	1,291.0	1.53%	172.5	13.2%	162.0	7,000	406
3	3	Oracle Corp.	1,027.8	729.3	40.93%	132.9	12.9%	36.4	6,811	407
4	4	Lotus Development Corp.	684.5	556.0	23.11%	102.7	15.0%	23.3	3,538	408
5	5	D&B Software Services Inc.	538.7	450.0	19.71%	N/A	N/A	N/A	3,800	409
6	6	Novell Inc. ¶	497.5	421.9	17.92%	59.3	11.9%	94.3	2,419	410
7	9	WordPerfect Corp.*	452.4	281.4	60.77%	49.4	10.9%	N/A	2,376	411
8	_	Mentor Graphics Corp.	435.2	426.4	2.06%	74.5	17.1%	23.6	2,747	412
9	7	Software AG*	389.0	294.0	32.31%	97.3	25.0%	N/A	3,800	413
10	_	Policy Management Systems Corp.	346.1	265.6	30.31%	58.2	16.8%	37.2	4,204	414
11	8	McDonnell Douglas Systems Integration Co.	271.0	290.0	-6.55%	32.0	11.8%	6.0	2,000	415
12	13	American Management Systems Inc.	262.0	225.3	16.29%	12.0	4.6%	12.0	2,900	416
13	15	Ask Computer Systems Inc.	249.7	189.5	31.70%	22.2	8.9%	4.7	2,084	417
14	14	SAS Institute Inc.*	240.2	205.6	16.83%	100.9	42.0%	N/A	2,230	418
15	_	CompuServe Inc.*	238.9	203.1	17.63%	N/A	N/A	N/A	1,500	419
16	17	Autodesk Inc. §	237.9	178.6	33.20%	24.4	10.3%	56.8	905	420
17	12	Pansophic Systems Inc.	232.2	199.3	16.51%	16.9	7.3%	19.6	1,583	421
18	_	Cadence Design Systems Inc.	231.4	159.9	44.72%	42.6	18.4%	38.0	1,663	422
19	11	Ashton-Tate Corp.	230.5	265.3	-13.12%	39.7	17.2%	-18.1	1,620	423
20	18	Cincom Systems Inc.*	207.7	165.1	25.80%	N/A	N/A	N/A	1,358	424
21	16	Sterling Software Inc.	207.0	184.4	12.26%	27.2	13.1%	18.3	1,900	425
22	10	Bolt, Beranek and Newman Inc.	204.3	236.2	-13.51%	24.6	12.0%	N/A	2,300	426
23	19	Information Builders Inc.*	191.0	160.0	19.38%	28.5	14.9%	N/A	1,400	427
24	28	Borland International Inc.*	190.8	104.4	82.76%	17.5	9.2%	21.2	986	428
25	21	Legent Corp.	180.5	142.8	26.40%	38.3	21.2%	34.7	1,200	429
26	26	Adobe Systems Inc. ^	168.7	121.4	38.99%	N/A	N/A	40.1	500	430
27	22	Information Resources Inc.	166.7	136.4	22.21%	N/A	N/A	2.8	2,982	431
28	27	Software Publishing Corp.	153.5	110.4	39.04%	25.3	16.5%	20.6	723	432
29	24	Candle Corp.*	151.4	128.1	18.19%	45.2	29.9%	N/A	1,000	433
30	20	Informix Software Inc.	146.0	145.0	0.69%	15.0	10.3%	-46.4	1,350	434
31	25	Compuware Corp.*	143.0	123.0	16.26%	N/A	N/A	N/A	1,244	435
32	_	Aldus Corp.	134.9	98.0	37.76%	N/A	N/A	N/A	N/A	436
33	30	System Software Associates Inc. •	121.0	94.9	27.50%	7.6	6.3%	17.1	N/A	437
34	29	Cognos Inc.	120.0	98.6	21.70%	13.7	11.4%	6.0	1,041	438
35	37	The Santa Cruz Operation Inc.*	119.0	83.0	43.37%	17.0	14.3%	N/A	1,326	439
36	33	Goal Systems International Inc.	116.9	86.4	35.30%	14.6	12.5%	10.3	800	440
37	38	BMC Software Inc.	116.6	76.3	52.82%	17.4	14.9%	22.6	548	441
38	31	Comshare Inc.	116.0	94.6	22.62%	16.5	14.2%	6.4	980	442
39	40	Systems Center Inc.	105.0	78.0	34.62%	23.0	21.9%	-28.0	841	443
40	41	Symantec Corp.	102.0	71.0	43.66%	14.0	13.7%	7.0	520	444
41	39	Boole & Babbage Inc.	100.2	78.9	27.00%	15.6	15.6%	4.8	654	445
42	34	American Software Inc.	99.1	88.4	12.10%	3.6	3.6%	17.2	812	446
43	36	On-Line Software International Inc.	96.7	86.0	12.44%	7.7	8.0%	4.0	659	447
44	46	KnowledgeWare Inc.	92.3	50.1	84.23%	10.5	11.4%	11.7	555	448
45	42	Softlab Inc. *	86.7	70.5	22.98%	18.0	20.8%	N/A	750	449
46	32	Interleaf Inc.	84.0	92.0	-8.70%	17.0	20.2%	-2.0	756	450
47	43	Micro Focus Inc.	84.0	58.1	44.58%	11.8	14.0%	15.7	330	451
48	_	J.D. Edwards & Co.	79.4	42.5	86.82%	5.7	7.2%	4.6	682	452
49	44	Attachmate Corp.*	78.0	56.4	38.30%	N/A	N/A	N/A	N/A	453
50	_	Sage Software Inc.	70.0	62.0	12.90%	13.9	19.9%	1.8	470	454
		TOTAL	13,385.9	10,807.0	23.86%					

NOTES:
Revenue, R&D and net income are in $ millions.
* DATAMATION estimate

* Privately held
§ Based on fiscal year ending Jan. 31, 1991
¶ Based on fiscal year ending Oct. 27, 1990

^ Based on fiscal year ending Nov. 30, 1990

For more information, circle appropriate number on Reader Card

platform vendors and the software vendors—the direction that we want to go in."

That direction generally reflects a group of technologies for which relatively few products actually exist today—in particular, easy to use interfaces, interoperable applications and hardware, and consistent standards across all systems. Windows, which meets the demand for an easy to use interface, is an exception. Sybase Inc.'s SQL Server and DB2 Gateway technologies are others. IBM's new, more powerful OS/2 2.0 Presentation Manager is an untested but possible contender for that honor this year.

But Windows has taken some eight years to develop to its present state, OS/2 has been in development for four years and neither is a finished product even now. Sybase has been struggling for years to prove its client/server products in the field while also continuing to evolve them to meet fast-changing user demands.

"Let's face it," say Carole Morton, president of Sterling Software Inc.'s Dylakor Division, "everyone has gone client/server happy. Local area networks. How we get everybody to talk to everybody. All this heterogeneous data. Everybody wants SQL. How is all this going to happen?"

Software vendors are working hard to make it happen by continuing to boost spending on research and development aimed at redirecting technologies. Examples include SAS Institute Inc., where R&D spending chews up some 42% of revenue. SAS is in the midst of a major effort to develop its new SAS Application System 6.07, which will include a Windows 3.0 interface, interoperability with other vendors' hardware and software, advanced client/server capabilities and other new technologies. Software AG is also spending mightily on R&D (25% of revenues) in order to redirect its products into a client/server environment. And Legent Corp. is devoting some 20+% of its revenue to prepare for IBM's SystemView network management technology while also moving its formerly mainframe products into the client/server, Windows 3.0 mode.

Similarly, Charles B. Wang, chairman of number two software giant Computer Associates, says CA continues to focus its $173 million in R&D spending on the compam's evolutionary CA90s software architecture, which is aimed at helping CA's customers implement interoperability. But it will be a long time coming. "We should have introduced it earlier than we did," he admits now.

Full implementation of CA90s will take years to complete, says Wang. Even so, he adds, CA users have shown great enthusiasm for the new architecture.

"I think the power and the cost—the economic things—are driving users toward this distributed world more and more," he says. "They've got to be heterogeneous because they cannot have the kind of thing where they are totally dependent on one vendor. We have to offer to our clients the ability to have portable solutions across multiple platforms."

The Evolutionary Approach

Like CA, most software vendors are offering users an evolution of their existing product lines, not a revolution in technology. Some 18 months ago, Atlanta-based Management Science America Inc. (MSA)—now a part of fifth-biggest software vendor Dun & Bradstreet Software Services Inc.—decided to move strategically away from its historical market of strictly mainframe financial, accounting and manufacturing applications. The move to the future, it determined, was to come via client/server computing. But it wasn't exactly an overnight delivery process.

"I hired [former McCormack & Dodge Corp. technical guru] John Landry back into the fold for the express purpose of migrating 14,000 customers at their own speed to client/server applications," says D&B Software chairman John P. Imlay Jr. A year and a half into the major R&D effort, Imlay is quick to concede that client/server computing is not a reality yet for D&B customers. "If you are on standard mainframe applications now, you'll add modules, and in three years you'll be client/server operation-

Welcome 1990's Newcomers

Who's new among the top 50 software vendors this year.

RANK 1990	COMPANY	TOTAL REVENUE 1990	1989	% CHANGE
8	Mentor Graphics	435.2	426.4	2.06%
10	Policy Management Systems	346.1	265.6	30.31%
15	CompuServe	238.9	203.1	17.63%
18	Cadence Design Systems	231.4	159.9	44.72%
32	Aldus	134.9	98.0	37.76%
48	J.D. Edwards	79.4	42.5	86.82%
50	Sage Software	70.0	62.0	12.90%

All revenue in $ millions

Ten Who Would Dare

Watch these 10 vendors—they're climbing fast.

COMPANY	TOTAL REVENUE 1990	1989	% CHANGE
Marcam Corp.	33.3	16.7	99.40%
Software 2000 Inc.	38.6	20.0	93.00%
Central Point Software Inc.	48.3	27.0	78.89%
Progress Software Corp.	40.1	25.4	57.87%
Ross Systems Inc.	40.0	26.1	53.26%
Consilium Inc.	32.4	23.1	40.26%
Unify Corp.	32.4	25.6	26.56%
Cadre Technologies Inc.*	53.0	42.0	26.19%
The MacNeal-Schwendler Corp.	56.6	45.0	25.78%
Interactive Systems Corp.	50.0	40.0	25.00%

* Privately held
All revenue in $ millions

ally—if you deem you want to be. It's a migration path."

Sterling Software is another among the many software companies that talk fast about new technologies but go slow in implementing them. In 21st place with sales of $207 million last year and R&D spending of $27.2 million, Sterling is working on a multitiered development project to make its software products interoperate across platforms using Windows 3.0 or OS/2 Presentation Manager-based user interfaces.

It is a complex, expensive and time-consuming effort, says Morton, which needs a balanced approach in the trade-off between enhancement and innovation.

Leapin' Ledgers!

After kicking and screaming for nearly eight years, the software industry has resigned itself to playing by new rules that could easily change vendors' positions in next year's Top 50.

The American Institute Of Certified Public Accountants (AICPA) is putting the final touches on its new guidelines for software revenue accounting. In a nutshell, the rules would prevent software companies from recognizing (booking) as revenue the entire support and maintenance portion of an initial license fee at the point when the contract is signed. Those dollars would have to be recorded piecemeal (prorated) across the term of the agreement, which often extends for a number of years.

The change in accounting makes no real difference in the amount of money a software company collects. But it could make a company's apparent short-term revenue and profit look smaller, making software companies unattractive to investors or customers who may not understand that the apparent performance drop is made of paper, not money.

As the new rules have come closer to confirmation, the American Software Association, a division of The Computer Software and Services Industry Association (ADAPSO), has lobbied for adjustments. Earlier this year, the ASA issued a statement of position on the rules that warned of "a disastrous impact on the American software industry and its ability to compete in a global market." But the AICPA's proposal is scheduled to go before the accounting community's standards-setting body—the Financial Accounting Standards Board (FASB)—in November. If approved by FASB, to take effect in fiscal 1992, software makers will have to take a deep breath, quickly retool their books and start explaining to investors, banks and stockholders.

Beyond the effect on the books lies a worry that software companies might be forced to make changes in their support practices to soothe the sting. "The concern is that people will get more inventive and creative in their business practices in order to avoid some of the difficulties," says Douglas Jerger, vice president of the ASA and a Certified Public Accountant. "That could cause some disruption of the relationships here." In particular, multiyear support agreements included with initial licenses may become scarce, according to Joseph Tibbetts, chairman of the Financial Practices Task Force of Price Waterhouse's Software Business Practices Committee.

"We are going to have to change our business practices," admits Michael Musson, investor relations manager for Oracle Corp. Publicly held Oracle saw the change coming and bit the bullet last year, tweaking its accounting and support policies and taking a $53 million write-off to bring the books in line. Musson says that the impact on customers will be minor.

The ruling "doesn't affect our customers at all," agrees Stan Krejci, vice president for corporate operations and chief financial officer for Landmark Systems Corp. Landmark also adopted the new rules in 1990—despite the fact that they may be adjusted slightly before they take effect. "We certainly took hits to the bottom line," says Krejci, "but since we're not a publicly traded corporation, the only people we have to satisfy are the principal stockholders."

Goal Systems International Inc. has announced its anticipated hit, and, "as a result of that, Goal's stock has gone down," says president and chief executive officer David Wetmore. But Wetmore, too, is emphatic that this is only a temporary glitch for software companies, that customers won't be affected. And Thomas Nies, president and CEO of Cincom Systems Inc., the fourth largest privately held software firm, says the change isn't all bad. Nies has long pushed for new policies for more consistent accounting.

But good or bad, the rules are coming. And the only cure for that, says Jerger, is to make sure investors and customers understand. "The only thing to do," Jerger advises, "is to talk to people a lot."

—Ned Snell

To keep customers up to speed, Dylakor and the other Sterling companies are phasing in a 20-stage new technology "Odyssey Project," as Sterling calls the effort. "Some of these stages will help our customers get to the future," says Morton.

As with Computer Associates's CA90s, and D&B's client/server efforts, the Odyssey project is no revolution. It is, instead, an evolution of existing products that will come on line in phases over the next several years. Users will have plenty of time to phase in each upgrade—if and when they choose.

And Sterling is not entirely certain that users will always choose to do so. Even though users say they want newer technologies, Morton points out, they also are sticking with the technologies they have already invested in, know well and can use most easily. "Software companies have a responsibility to protect the investment that clients have made in existing software," Morton says.

The Fastest Climbers Of The 50

The fastest rising companies by percent growth.

RANK 1990	RANK 1989	COMPANY	TOTAL REVENUE 1990	TOTAL REVENUE 1989	% CHANGE
48	_	J.D. Edwards	79.4	42.5	86.82%
44	46	KnowledgeWare	92.3	50.1	84.23%
24	28	Borland International	190.8	104.4	82.76%
7	9	WordPerfect	452.4	281.4	60.77%
1	2	Microsoft	1,477.8	951.8	55.26%
37	38	BMC Software	116.6	76.3	52.82%
18	_	Cadence Design Systems	231.4	159.9	44.72%
47	43	Micro Focus	84.0	58.1	44.58%
40	41	Symantec	102.0	71.0	43.66%
35	37	The Santa Cruz Operation	119.0	83.0	43.37%

All revenue in $ millions

In fact, some of the fastest growing software vendors in the Top 50 are still selling, in effect, updates of basic older technologies. For example, J.D. Edwards & Co., whose revenues rose the fastest of them all, up by some 87% last year, just keeps on improving and selling its mainstream AS/400-based financial applications. KnowledgeWare Inc., the second fastest riser (up by 84%), is still selling IBM mainframe-based, COBOL-generating, computer-aided software engineering technology, which can now run under IBM's powerful OS/2 Presentation Manager operating system. WordPerfect Corp., fourth on the fastest growers' list, never even offered a Windows-3.0-based product last year, yet its customers kept coming back. Other mainstream vendors—including Boole & Babbage Inc., Cincom Systems Inc., Goal Systems International Inc. and Systems Center Inc.—also saw tremendous double-digit growth last year, sans client/server or Windows 3.0 technologies.

Ask vendors that are pushing into new technologies why they're doing so, rather than just improving existing systems, and they'll all tell you the same thing: customers already have the old, and now they want the new. "The drive seems to be coming from the user community," says Burton Grad, president of Burton Grad Associates, a systems consultant in Tarrytown, New York. "It's not something the software firms are particularly pushing."

But ask vendors how well they're doing in delivering these new technologies, and even they will give themselves mixed reviews.

"My personal view is they haven't done a good job," says Dylakor's Morton. "They can't. The technology is moving too fast."

Others says there are too many marketing gimmicks in the way of seriously advancing computing. CA's Wang says vendors have failed to evolve technology at anything close to an acceptable pace. "I don't think they're phasing [new technology] in," he says. "I think they are trying to obsolete the technology so they can sell it again." He points to IBM's software strategy as particularly troublesome. "Just look at PC-DOS and OS/2. Why is it that SQL on the AS/400 is different than the one on DB2? And why don't they put SQL on top of IMS? DB2 is just IBM's implementation of SQL on MVS. The answer is, they want to obsolete IMS."

Even the eternally optimistic Imlay of D&B Software is withholding judgment on how well the mainframe software companies are faring in delivering new technologies. "The jury is still out," he says.

"They're not as responsive as we would like to see," says Schabes of Citicorp. "We get responses like, 'Well, when the technology matures . . .' and 'In a few years . . .' We really need more honestly committed responses than we've been getting."

And she plans on being right out front to make certain the vendors know exactly what new technologies she wants and when. "The message we're communicating is: make this a very high priority of yours because we're making it a very high priority of ours."

—With research by Susan Mael.

For a look at Software's Up & Comers see page 66

Software's Up And Comers

So who will rise out of nowhere and become the next Computer Associates International Inc., Lotus Development Corp. or Microsoft Corp? While the big guys grab for bigger and bigger pieces of the software market, a drove of small, hungry companies are beating a trail to users' doors by way of the latest in technology. The five companies profiled here have a good shot at making it onto DATAMATION's Top 50 Software Vendor list in the future, thanks to their ability to create innovative products and stay ahead of leading edge technologies. If they don't yet sound familiar to you, just wait a minute or two. Apart from a few Apple II Floating Point BASIC aficionados, who'd ever heard of Microsoft before 1981?

Inference Corp.
El Segundo, Calif.
Circle No. 225 on Reader Card

Inference Corp. is enjoying success in a market that few companies have prospered in: knowledge-based software. Inference designs, sells and installs knowledge-based development systems. Its main product, the Automated Reasoning Tool For Information Management (ART-IM) runs on everything from DOS and OS/2 PCs to mainframes under MVS. The company has an installed base of over 13,000, including customers like American Airlines Inc., Dun & Bradstreet Corp. and Nippon Steel Corp. Revenues for fiscal year 1990 topped $15 million, and the company is looking to break $18 million in 1991.

The company's latest product is called Case Based Reasoning (CBR) Express/Windows, a Microsoft Windows-based front end into the ART-IM system for quick application development on PCs running Windows.

PeopleSoft Inc.
Walnut Creek, Calif.
Circle No. 226 on Reader Card

Client/server! Graphical User Interface! Windows! Almost all software on the market has been emblazoned with these monikers since the GUI revolution began with Microsoft Windows 3.0 last year. All, that is, except for the lowly cog of corporate software—human resource packages. But PeopleSoft Inc. wants to change all that.

The company launched a line of HR software—payroll, benefit administration and human resources—that operates under Windows and ties to corporate databases through a Structured Query Language (SQL) interface.

PeopleSoft has been shipping client/server HR systems on local area networks and mainframes since 1989 and boasts more than 50 *Fortune* 1,000 customers.

Powersoft Corp.
Burlington, Mass.
Circle No. 227 on Reader Card

In March, Powersoft Corp. introduced PowerBuilder, a Windows 3.0-based SQL front-end development environment that's designed to be used by teams of programmers. It has proven to be a hot seller for the company because it lets programmers choose between using a traditional procedural language or an object-oriented, event-driven approach to building client/server applications. PowerBuilder doesn't require mainframe developers to relearn programming on the PC: it looks and feels like a mainframe-system, only it runs under Windows.

Dun & Bradstreet Software Services Inc. liked the PowerBuilder tools so much it's buying into the company. The old-line mainframe software vendor announced in July that it will use PowerBuilder to add Windows-based client applications to its mainframe-based human resource and financial software. That could generate $20 million in revenue for Powersoft over the next five years.

Servio Corp.
Alameda, Calif.
Circle No. 228 on Reader Card

Servio Corp. introduced the first commercial object-oriented database in 1987 and hasn't slowed down since. The company began in 1982 as a research and development organization for object-oriented database technology and has since become one of the leading vendors.

Servio introduced version 2.5 of its GemStone object-oriented database server in February. GemStone uses object-oriented technology to store data in the form of sound, graphics and images. The database caught the eye of IBM, and in March Servio agreed to port the database to the RS/6000 workstation. In May, the company was named an IBM business partner to sell RS/6000s bundled with the GemStone database system.

So what's next? Ties to other databases and new platforms, Servio says. GemStone currently runs on DEC VAX/VMS machines and UNIX platforms.

The Whitewater Group
Evanston, Ill.
Circle No. 229 on Reader Card

When many PC software developers think of object-oriented programming (OOP), they think of The Whitewater Group. Since its founding in 1985, the company has specialized in OOP. The company is so good at OOP, that Borland International Inc.—a company that constantly touts its own OOP capabilities—sought out Whitewater's expertise when developing the Windows 3.0 versions of its products. The two companies have created ObjectWindows, a multivendor library of routines.

Whitewater's flagship product, Actor, is an object-oriented programming tool for building Windows applications. Recent additions to the company's line include Actor Professional, which comprises Actor and two tools—ObjectGraphics, an object-oriented graphics library, and the Whitewater Resource Toolkit, a Windows screen-painting tool. New this year is WinTrieve, a database-like file manager for Windows.

—Mike Ricciuti

Why Leased Lines Cost So Much

Crossing a border with a leased line can be a shock to the budget. But competition is bringing prices down, and new regulations may make them more manageable.

BY MARSHA W. JOHNSTON

"Wide-area networking in Europe is going to be a disaster unless the PTTs can somehow learn to work together," declared David O. Williams from the podium of a recent conference on future computing architectures.

"To lease a 64-Kbit line from Glasgow to Oxford costs me x pounds per month. To put in the same line from Oxford to Geneva, which is 50% further, is 15 times more expensive per month," says Williams, who is leader of the computing and networks division of CERN, Europe's particle physics research lab, based in Geneva. His concern about the cost of cross-border networking on 64-kilobit-per-second leased lines provided by the Post, Telephone and Telegraph agencies was echoed repeatedly at the conference by users and computer vendors alike.

In fact, the cost for a 320km-long leased 64Kbps line that crosses two borders can be as much as 20 times higher than a comparable line in the United States, says Audrey Mandela, vice president, international, for Yankee Group Europe in Watford, U.K. She adds that a domestic leased line in the United Kingdom does not cost that much more than it does in the States.

The Culprit

The higher cost of cross-border leased lines clearly has little to do with the cost of the technology and more to do with differences in the cost structures of the various national service providers.

Europe's tariffs are set "to the maximum the market will stand within the business objective of the PTTs," says Brian Gray, vice president of network equipment vendor Timeplex Europe Africa in Slough, U.K. He adds that there is no technical reason why they should be different from country to country or higher than those in the United States.

Although there may be some costs involved in connecting equipment from different vendors when crossing borders, Yankee Group's Mandela believes Europe's widely varying tariff structures have more to do with whether the PTT is part of the government and, as such, is expected to subsidize another part of that government. Before deregulation in Germany, for instance, the telecom division of the Deutsche Bundespost subsidized the postal service, she points out.

Countries with antiquated infrastructures, like Italy and Spain, have higher tariffs because they need a lot of money to modernize them, Mandela notes.

Charging more for specialized services is another way to subsidize inefficient infrastructures, says Mandela. "In Spain, they have increased tariffs for certain services such as mobile [phones] because [otherwise] it's too expensive for them to provide the service," she says.

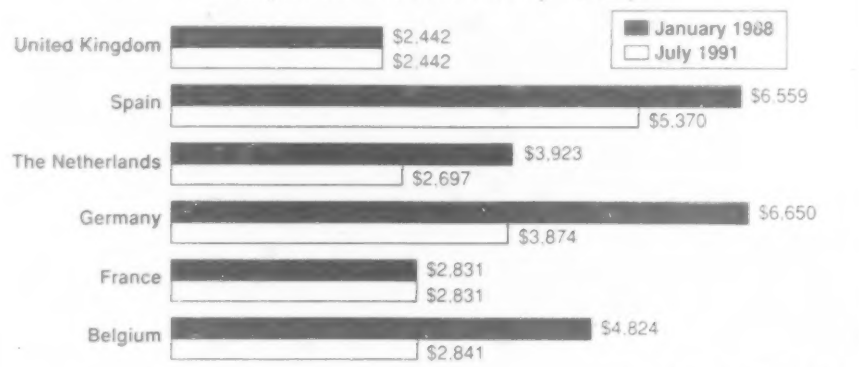
Trying to avoid high tariffs in certain regions of Europe can create extra costs for users. "Say you have headquarters in Spain and another major site in France, and you're trying to decide, on a European basis, where to centralize your communications activities," explains Ben Bovum, European group IS manager for London-based foodstuff-producer Cargill PLC. Making the decision requires looking at the available skills and the cost and availability of services. "Spain is more expensive, and the skills you need are, maybe, less available. And so Spain could end up being a remote site, even if it makes more sense to have the center there because it is closer to your business activity," Bovum says. As a result, he adds, you may decide to pay more to install extra backup capability on the link to Spain, since it carries critical information.

> A leased line in the U.K. doesn't cost much more than it does in the States.

Despite the confusing variations in leased-line tariffs, relief for users is com-

A Tangle Of Tariffs

Although prices have come down sharply in many countries, the monthly rental charge (in U.S. dollars) for a 64Kbps half circuit to Sweden, as of July 1991, still varied by as much as 120% from country to country.



Source: Tarifica Service Logica

ing from a couple of quarters. Competition among the PTTs, from other telephone carriers and from the users themselves is pushing prices down in many countries. A British Telecom spokesperson, while acknowledging that there is a wide variation in tariffs, also says that there is an increasing movement toward prices that more directly reflect the cost of providing the service. The Commission of European Communities, aware of the role international leased lines can play in making unified Europe a bigger industrial power, is moving to introduce regulations that would make the rates more uniform and more cost-based.

Already, as Cargill's Boyum says, European tariffs are moving rapidly and going "mostly in the right direction—down." In fact, a sampling of data from the London-based research house Tarifica Service/Logica Ltd. shows that in seven European countries the majority of monthly rental charges for a 64Kbps half circuit has dropped significantly since January 1988. (A half circuit begins at one carrier's international gateway and ends at the midpoint on the leased line between the two countries involved. Each PTT, therefore, levies its part of the monthly charge.) The cost of a 64Kbps half circuit to Sweden, for example, from Germany or Belgium has dropped by 41% between January 1988 and July 1991. From The Netherlands it has dropped by 31% and from Spain by 18%.

Europe's tariffs are set to the maximum the market will stand.

The trend toward more competition for the national carriers picked up steam in April with the arrival of Tele2 AB, an independent rival to the Swedish national PTT, Televerket (see sidebar, "Sweden Sweetens The Competitive Pot"). In Britain, competition from Mercury Communications Ltd. has contributed to an overall drop in service and line charges at British Telecommunications PLC, including a 17% drop in per-kilometer charges for 64Kbps leased lines last spring. More recently, in August, BT dropped its international phone charges by as much as 20%.

Even without a second national carrier, Yankee Group's Mandela predicts, the existing PTTs in countries like France or The Netherlands will continue to drop their international circuit charges over the next three to four years, as they install more cables throughout Europe. With the extra capacity, these carriers will try to lure international businesses into using their countries as hubs for wide area networks.

Europe's national carriers are also keeping an eye on foreign competition. AT&T, for instance, is building a network across 17 European countries to compete with the PTTs for packet-switching and managed network services such as electronic data interchange (EDI) and e-mail. And Mandela points out, "it's a 2-megabit-per-second network with NET [Network Equipment Technologies Inc.] multiplexers, so it could be used for anything," including leased lines.

Competition From Users

Nevertheless, she believes, competitive pressure on the PTTs is more likely to come first from users reselling extra capacity. In fact, she adds, if the PTTs don't cut their tariffs on international leased lines, their own users may just steal away their business. The Consultative Committee On International Telephony And Telegraphy (CCITT) is amending its guidelines for leased-line use to endorse the concept of users reselling their excess capacity to other companies. In the wake of such a political sea change, which is expected to take effect sometime this year or early next, Mandela says, "there should be some international resale on those routes, which should help drive down the cost."

Meanwhile, a draft of the Commission's new Open Network Provision (ONP) directive is moving slowly through the legislative process, which could take another nine months.

The provision's directives calling for cost-oriented tariffing, as they currently stand, favor users. Although they could be watered down in the legislative process, it is thought unlikely because the current directive is a revision of a first draft that was widely criticized as heavily favoring the PTTs. A 1991 Yankee Group report on reregulation in Europe concluded that the provision, in its current form "would transform the conditions under which leased lines are supplied in Europe and represents a major success for the Commission."

Trying to avoid high tariffs in certain regions can create extra costs.

Indeed, as Mandela sees it, the Commission's direction is clear. "In the last couple of years, they have made it clear that their policy will be to make tariffs as close to cost based as possible. [And] there has been a push by the Commission for transparency in tariffing. They're not saying tariffs should be the same, but that they should be easy to understand and take apart by the user. The Commission just wants to make sure an enormous profit margin is not being gouged out of the users."

Sweden Sweetens The Competitive Pot

As only the second challenger to a national telephone carrier in all of Europe, Sweden's Tele2 is eying cost-based tariffing but says it will be driven above all by the need to provide a greater variety and quality of services to the market.

"Our objective is to compete with the service quality of everyone. We don't think the customer is interested only in getting cheaper service," says Kjell Nilsson, sales director for Tele2, a joint venture between Sweden's Industriforvaltnings AB Kinnevik and Britain's Cable & Wireless PLC. Cable & Wireless is the founder of the only other challenger to the national Post, Telephone and Telegraph (PTT) agencies, Mercury Communications Ltd. in the United Kingdom.

The new fiber-optic network is being installed under a 25-year agreement with the Swedish Railroad Administration. In its first phase of operation, scheduled for the beginning of next year, it will cover a triangular area around Stockholm that contains about 80% of Sweden's population.

Tele2 has already implemented a public Transmission Control Protocol/Internet Protocol (TCP/IP) network service for LAN-to-LAN communications and will add an X.25 service open also to Systems Network Architecture (SNA) communications this month or next. It will offer 64Kbps and other international leased digital lines in the second quarter of 1992.

MARKET INSIGHTS

AN ANALYSIS OF ECONOMIC TRENDS

Hopes Dashed, Upturn Postponed

BY MADELINE FRANCHI
Cahners Economics

Tough times continue for the information systems industry. The DATAMATION Information Systems Performance Indicator (ISPI) edged downward to 93.4 in June from a revised 94.12 in May. As of October, it hovers at a predicted 97. New orders for IS equipment dropped sharply from May to June and took a nosedive of 6% relative to a year ago. That's the worst performance the industry has seen since mid-1986. Such news always discourages would-be investors, which continued to hold back growth in the high-technology stocks. That also holds back growth of our ISPI.

The good news in all this is it could be worse: the indicator once fell even further, back in November of 1986, when it hit a low of 88.24.

Furthermore, IS manufacturers see a few signs that could indicate an upturn. Inventories in June ($15.47 billion worth) shrunk so low they'll have to turn up soon just to meet today's modest level of demand.

Encouraging signs are also popping up among the data on the number of average weekly hours worked by computer industry employees. Average hours increased steadily from April through June.

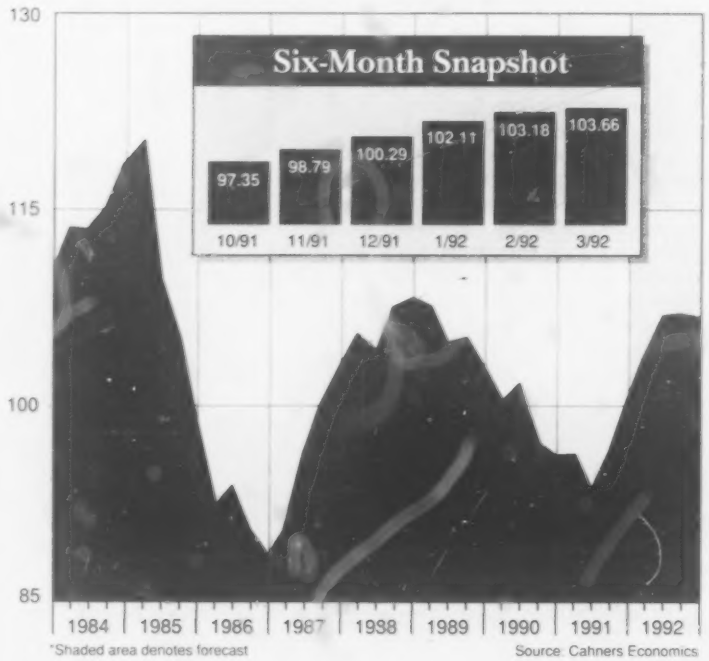
If that's the good news, what's the bad news? The ISPI's low level could also mean the IS industry is poised for a later rebound than we had originally expected. But until more data come in, we're sticking with our forecast for an upturn beginning in next year's first quarter.

Although computer manufacturers will begin to sense some uplift late in this quarter, they won't feel the full force of recovery until late in 1992 or early in 1993.

For more information on Cahners Economics's forecasting services, including seminars, newsletters and database diskettes, call Dan Buchan at (617)-630-2105, send him a fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington St., Newton, MA 02158.

The IS Performance Indicator

The IS manufacturing industry is a little weaker than expected.



*Shaded area denotes forecast

Source: Cahners Economics

	June 1991	May 1991	% Change 6/91-5/91	June 1990	% Change 1990/1991
■ Information-Processing Equipment					
Shipments (SA, $ billions)	9.40	9.47	-0.8	9.40	0.0
New Orders (SA, $ billions)	9.30	9.48	-1.9	9.90	-6.0
Unfilled Orders (SA, $ billions)	27.99	28.08	-0.3	27.96	0.1
Inventory (SA, $ billions)	15.47	16.04	-3.6	16.79	-7.8
■ Computer Production Workers					
Employment (NSA, thousands)	265.6	266.3	-0.3	281.0	-5.5
Average Weekly Hours (monthly avg.)	41.3	40.3	2.5	42.0	-1.7
■ Stock Index					
S&P's Computer Systems Stock Price Index	164.6	167.6	-1.8	193.7	-15.0
■ Contracts & Orders					
New Plant & Equipment (SA, $ billions)	34.0	33.4	1.6	37.7	-9.8

SA= seasonally adjusted;
NSA= not seasonally adjusted

Source: U.S. Commerce Dept., Standard & Poor's forecasts: Cahners Economics

MARKET INSIGHTS

A SURVEY OF TECHNOLOGY TRENDS

IS Managers Favor More IT Alliances

BY WARREN CHILDS
Business Research Group

The U.S. information technology industry is finally catching onto Japan's not so secret success strategy: strong competitors make good allies. Just take a look at events of the recent past: IBM inks an alliance with Apple Computer Inc.; The Santa Cruz Operation Inc. signs a binary-compatibility pact with UNIX System Laboratories Inc.; and IBM, Digital Equipment Corp. and Hewlett-Packard Co., competitors all, agree to work together to build the Open Software Foundation's distributed-computing products.

What do IS managers think of this new competitive buddy system? They think it's great—with reservations.

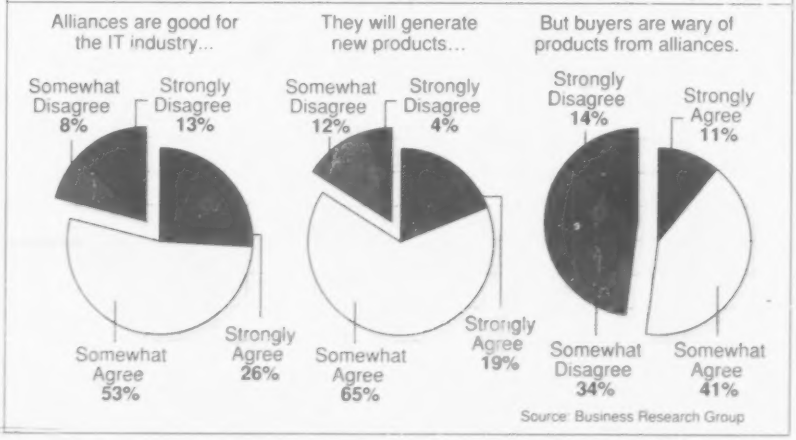
In our latest survey of the DATAMATION Technology Panel, respondents came out overwhelmingly in favor of alliances; more than 80% of panel members believe alliances will generate new products and services that might otherwise not be available.

Panel members predominantly agree that alliances are for the good of the industry and will make U.S. products more competitive with those of Europe and Japan. Only one-third agree that government should look more closely into alliances between technology companies.

But, when it comes to their own suppliers, panel members still have some reservations about such alliances. More than half agree that they would be more cautious when acquiring products born of alliances. Questions they raise include: Will there be a single point for product support? What is the long-term stability of the alliance? And what if one partner leaves?

For more information, call Nancy Finn at (617)-964-6204, send her a fax at (617)-558-4402 or write to her at the Business Research Group, 275 Washington Street, Newton, MA 02158.

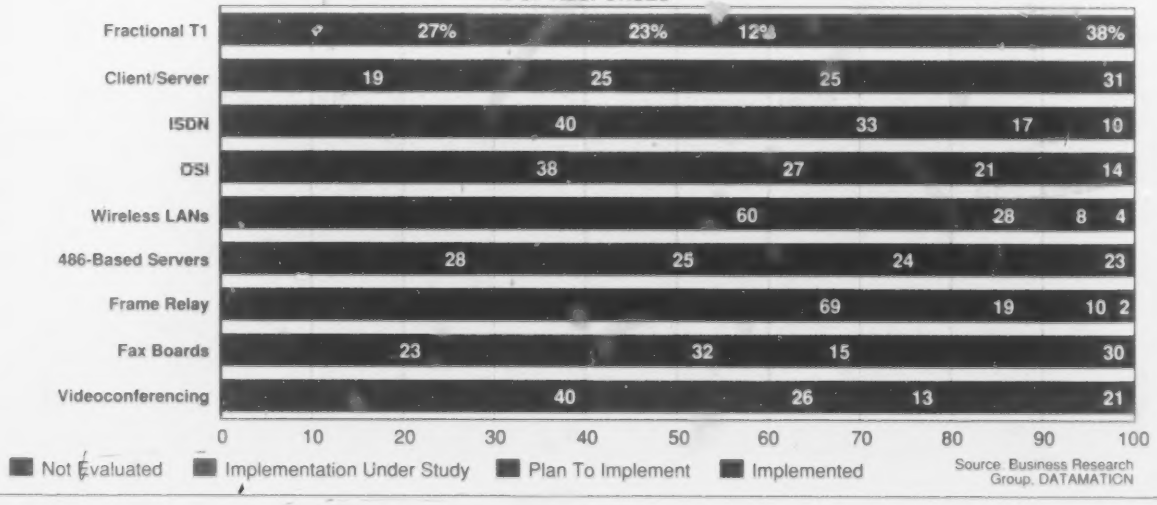
Business Alliances, Yes; Joint Products, Maybe



Source: Business Research Group

DATAMATION's Technology Implementation Index: Networks/Communications

DATAMATION each month surveys a select group of its readers--the DATAMATION Technology Panel--to investigate the implementation of new technologies by key user organizations.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OSI 38 27 21 14
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Source: Business Research Group, DATAMATION

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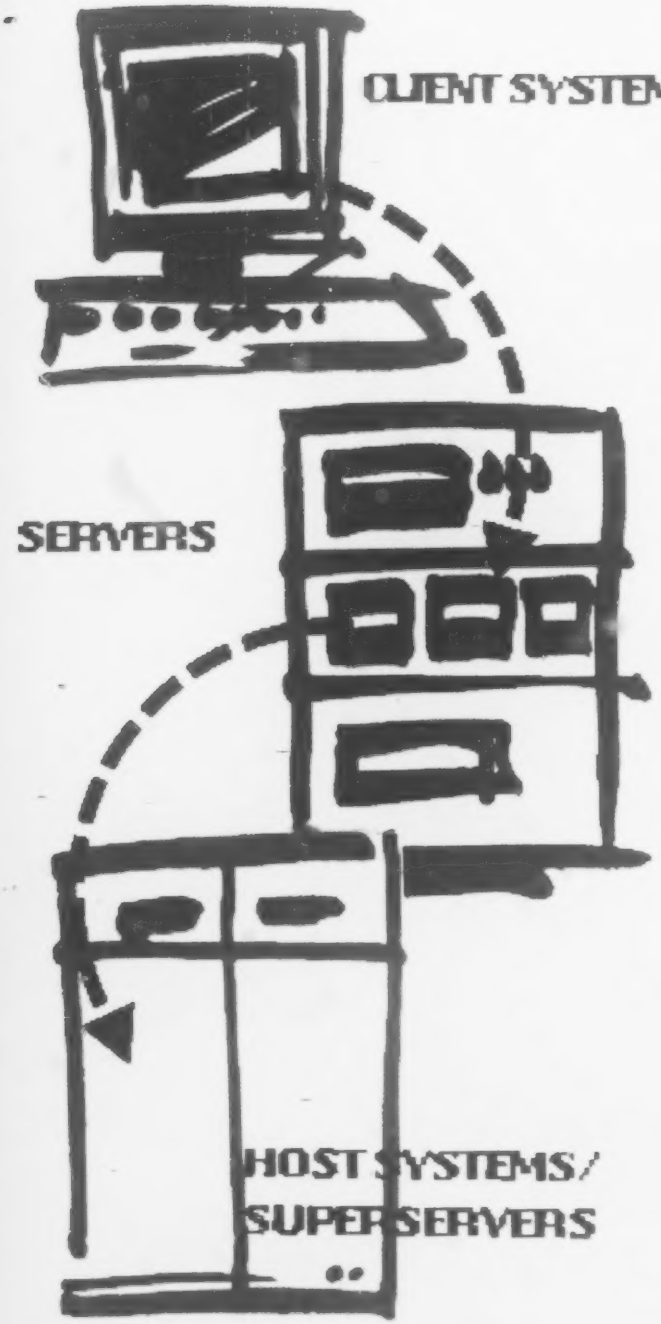

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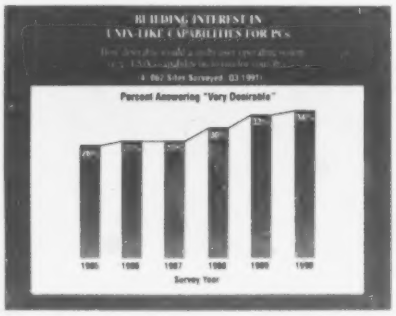

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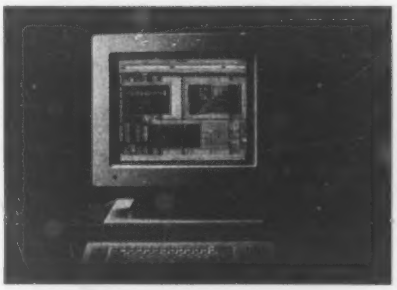

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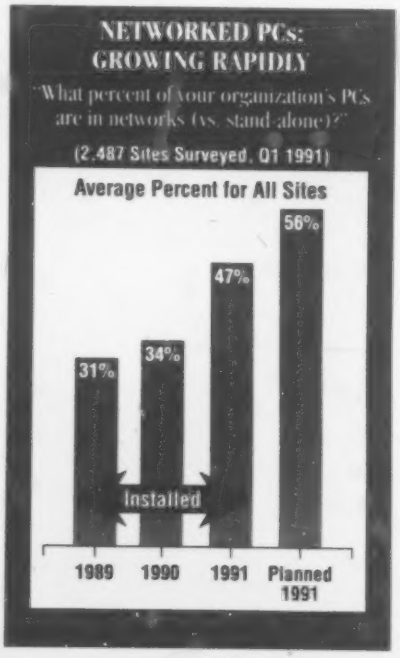
The Best in Client/Server Computing!

Exploring the evolution, implementation and real-world benefits of the IS technology that will dominate the 1990s

Three inescapable forces are converging to thrust information systems (IS) managers toward client/server computing:

• *Technological:* the power of today's desktop systems—coupled with advances in networking, relational database software and graphical user interfaces—are enabling organizations to use personal computers (PCs) and workstations for true corporate information processing.



• *Economic:* IS managers are under pressure to lower costs even as they improve and increase the enterprise's information processing capability.

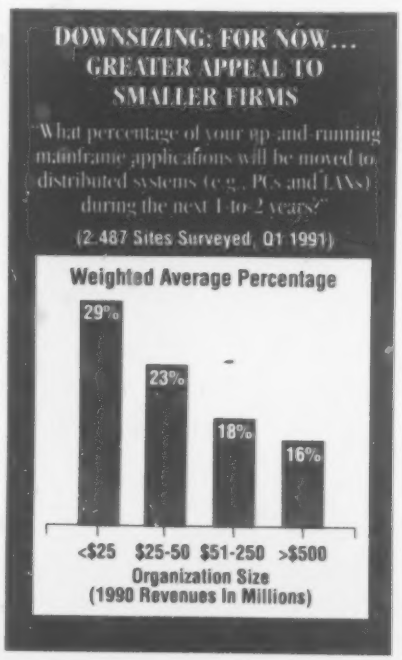
• *Organizational:* IS managers are charged with creating flexible systems that boost the productivity of revenue-generating and cost-saving employees.

Little wonder, then, that IS managers are moving swiftly toward client/server computing. Regardless of industrial, financial or geographic particulars, more and more organizations are downsizing from host mainframe architectures to make better use of the power of PCs and workstations and counter the isolation of important company data on PC networks, undertaking multivendor network integration, or shifting away from inefficient timeshared systems.

What do these organizations get for their efforts? Significant improvements in both end user and IS productivity. Information system consolidation. Better access to information technology. Eventual decreases in operating costs. Improved control of corporate data. An ability to create new corporate products and services. New kinds of IS applications.

"Downsizing enables an entirely new class of applications," says Chuck Sullivan, vice president of marketing at Channel Computing, the Newmarket, NH-based maker of *Forest & Trees*, a client/server-oriented data access and monitoring tool. "It's possible to provide people with the information they need to run their business—right at their fingertips."

The numbers of PCs that are in networks rather than in


DOWNSIZING: FOR NOW... GREATER APPEAL TO SMALLER FIRMS
"What percentage of your up-and-running mainframe applications will be moved to distributed systems (e.g., PCs and LANs) during the next 1-to-2 years?"
(2,487 Sites Surveyed, Q1 1991)
Weighted Average Percentage
29%
23%
18%
16%
<$25
$25-50
$51-250
>$500
Organization Size (1990 Revenues In Millions)

standalone mode have been growing dramatically for several years. But that is only a first step toward the productivity possible with client/server computing, an architecture which enables organizations to develop and run applications on PC-, Macintosh-, workstation- or minicomputer-based networks that support the same robust integrity, security and database facilities of traditional mainframes and minicomputer systems. Client/server software—unlike file-based network computing—affords secure and concurrent multiuser access to shared databases.

But because client/server computing indelibly affects not only the way an organization's IS operation functions but the way *all* departments, workgroups and employees do their jobs, both end user interests and needs as well as IS concerns must be addressed if client/server computing is to deliver its promise.

Planning for the Future with Sun

The Port of Singapore is one of the busiest in the world. Its ship planners, like air traffic controllers, must contend with myriad details—ship and truck schedules, stack weight and refrigeration needs, legal constraints such as crane clearance and trim and stability requirements—all in an effort to minimize turnaround time and keep shipyard operations running smoothly.

As the port grew, the tasks facing the ship planners became too complex for the mainframes they had relied on since the 1970s. Working closely with Singapore's Information Technology Institute, the port's computer experts designed artificial intelligence software to automate container, crane and transportation and storage-facility allocation, as well as generate loading and unloading schedules.

"The Sun network has helped increase productivity by more than 30% a year."

The software, implemented on a network of Sun Microsystems *SPARCstation* and *SPARCserver* systems linked to an IBM mainframe, mirrors as closely as possible the planners' own decision-making processes, helping them prepare stowage profiles and run crane operations. Onscreen, the workstations allow objects to be dragged and dropped, saves statistics and alternate plans for later use, and maintains a database on all shipping operations.

The Sun network has helped increase productivity by more than 30% a year because planners have more time to resolve fast-breaking problems and can move ships in and out of port more quickly and safely—saving both time and money.

"The system paid for itself within six months," reports Ang Chong Hoat, assistant manager in the port's cargo systems department. "And that doesn't take into account an estimated $30 million savings in staff costs over the next three years, thanks to increased planner productivity."

"It's been so successful," he continues, "that we are now working on four other systems to help automate other port activities. Eventually, nearly every activity in the port will be run by similar systems. Client/server networks like Sun's are the only sensible technical solutions today."

Sun Microsystems
What Kind of Client/Server Computing Will Do the Most For You?

Not all client/server computing models offer the same advantages. What is the ideal client/server scheme?

- It uses workstations and servers powered by a non-proprietary RISC processor.
- Its open UNIX operating system is paired with an open networking protocol like *ONC/NFS*.
- Since interoperability with other systems is so important today, it offers broad connectivity, regardless of computer type—linking with proprietary IBM and DEC systems, PCs from any

vendor, or even a supercomputer.
- And this solution has an intuitive graphical user interface such as OPEN LOOK that simplifies operation via point-and-click and drag-and-drop mouse controls.

While this open, standard solution allows scalability from the low to high end, it also lets users access information located anywhere on the network—on a mainframe, a minicomputer, a PC, or a workstation from a different vendor—whether the machine is located across the hall or across the globe. Rather than helping *individuals* become more efficient, this client/server model improves the results of the entire organization. That's because in this 'distributed computing' scheme, people and their work are linked to everyone else, sharing and sending information in milliseconds.

Using this client/server approach, an organization is assured of a productivity solution that integrates easily into an existing environment, thus preserving investments—both in equipment and people. There's no more fear of obsolescence. However, this solution also delivers an affordable, powerful growth path for many years. The bottom line is that companies adopting client/server computing improve productivity while gaining competitive advantage to succeed in their market.

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Motorola Commercial Systems Division

Seamless Client/Server Computing

Motorola's Commercial Systems Division (CSD) believes the computer companies of the 1990s will have to compete on quality, high performance, pricing, adherence to industry standards and the ability to add value to new or existing commercial computing solutions. In addition, users today want all of their hardware and software choices to work together seamlessly and to be easy to install and use. CSD provides computing solutions and integration services that make this possible.

CSD's historic pursuit of standards in product development have put the company in the vanguard of open systems in the 1990s. The company's *MultiPersonal Computing* environment—a networked office environment that allows easy integration into networks of heterogeneous systems—enables applications to be shared seamlessly regardless of operating systems or microprocessor architectures. The company's RISC-based servers are so 'open' that they can act as powerful engines not only for Motorola networks, but for any existing networks. Graphical user interfaces make interaction between user and computer as simple as point-and-click.

CSD's unequaled array of standards-based hardware and software products enables the company to provide an extensive level of systems integration for large bid orders. An independent software vendor (ISV) program ensures a steady stream of industry-leading applications, and CSD's active value added reseller (VAR) program generates a diversity of vertical applications for many commercial industries.

Circle 602 on Reader Card

This Strategic Directions Special Edition, the first of several to be published by *Datamation*, explores those interests, needs and concerns. To do so, a spectrum of demand-side market research has been tapped:

- Cowen & Co.'s institutional services division conducted two comprehensive studies of *Datamation's* readers in the third quarter of 1990 (4,062 survey participants) and the first quarter of 1991 (2,487 participants) that point to the growing reach of client/server computing for North American enterprises.

Downsizing Helps Motorola Compete

When a competitor threatened Motorola Cellular Subscriber Group's (CSG) market share by introducing the first $700 cellular portable phone, CSG was able to build a competing product in 20 days. And its IS group had a product support environment, complete with 800-number and credit card ordering, up and running in only three weeks.

According to Greg Goluska, director of MIS for the CSG, the ability to respond quickly is a direct result and primary benefit of downsizing from an mainframe environment to a distributed environment that includes RISC- and CISC-based systems made by Motorola's Computer Group.

"A distributed environment has meant a five- to ten-fold increase in programmer productivity. We could never have had the programs necessary to support the product developed on time working in a mainframe environment," says Goluska.

"The biggest benefit I see is the ability to handle change."

To compete in the fast-paced cellular phone business, all projects are completed in a four-month cycle. Goluska estimates there is a 50% chance that something taking longer than four months to develop will not fit the needs of the business by the time it is completed. Unlike the old static mainframe, the distributed environment allows IS to be flexible and accommodate the changes taking place in the company's operations.

"The biggest benefit I see is the ability to handle change," says Goluska. "Unlike other businesses which are driven primarily by technology, the cellular telephone business is market-sensitive. Product and service life cycles are shorter and constantly changing and IS has to be able to react to this change. In fact, whatever dynamics drive product development should also drive information systems development."

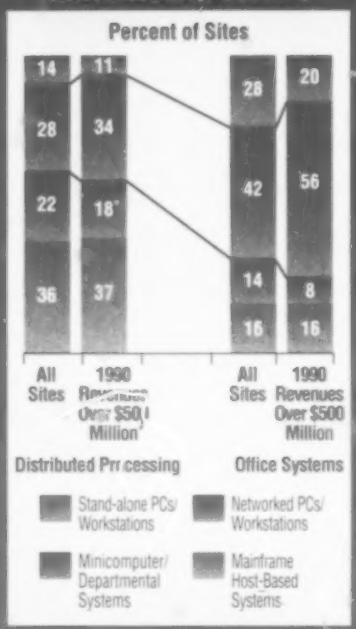
In addition to flexibility and capacity for quick response, downsizing has become critical to CSG's bottom line. Because the costs of cellular telephones are declining so dramatically, in order to double sales revenue CSG must *triple* its sales volume without tripling staff spending.

"The care and feeding of a mainframe gets expensive because you must have a number of systems programmers dedicated to maintenance," Goluska points out. "And adding functionality would mean buying another mainframe and dedicating more people to that system. In a distributed computing environment, whenever we want to add more functionality we simply add a processor. And only a processor."

NEW APPLICATIONS MOVE TO THE DESKTOP

"What is your organization's principle hardware orientation for the implementation of its newest distributed processing and office systems applications?"

(2,487 Sites Surveyed, Q1 1991)



• Business Research Group (BRG), a Cahners Publishing Co. subsidiary specializing in user demand-oriented market research, has undertaken several highly-focused surveys over the last year that unearth vital details about Fortune 1000 IS and end user executives' implementation plans for client/server computing.

Client/Server Computing Defined

Although there is tremendous diversity of opinion among those constructing client/server systems as to just what constitutes client/server computing, a couple of points of agreement can be discerned:

- Client/server computing requires a network linking at least two computers and the interaction between these machines results in some kind of synergy.
- Client/server computing is an enabling technology: applications must be written for it if it is to be truly effective.

BRG's queries of Fortune 1000 IS and end user executives who are implementing client/server systems produced many definitions; they fell roughly into four categories:

- Applications offering file- or peripheral-sharing or remote computer access.
- Applications that disseminate a database among more than one computer on a network.
- Messaging applications, such as electronic mail.
- Processing-intensive applications that distribute different computing tasks among connected computers.

BRG has defined client/server computing as *a system in which application processing is shared between a desktop 'client' and one or more network-attached 'servers.'*

"Successful client/server computing," believes TechGnosis, Inc.'s director of marketing, Keith Toleman, "requires the freedom to choose *any* hardware, operating system, database management system or development tool set." Each component of the system handles the tasks for which it is best suited and end users can easily access programs and data without knowing, logically or physically, where the networked resources are located.

"Unlike traditional cluster computing that has a limited capacity, client/server systems are infinitely expandable—additional hardware and applications can be added to the network as they are needed, without replacing existing hardware," notes Wayne Sennett, corporate vice president and general manager of Motorola's Commercial Systems Division.

Client/Server Parts

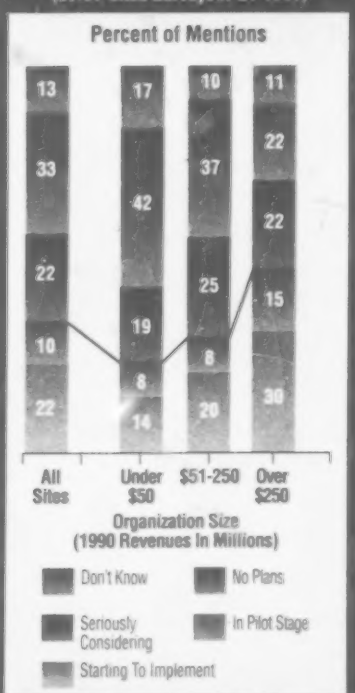
The components of client/server systems are nearly always linked by a local area network (LAN). LANs themselves can be connected by wide area networks (WANs); WANs allow an organization to construct an enterprise-wide network of workgroup, departmental and site-based LANs.

For those who need to link their networks to mainframes, gateway products have been developed. Rabbit Software, for example, offers *RabbitSTATION* and *RabbitGATE* for connectivity between IBM mainframe environments and PCs, PC/LANs and workstations. Rabbit's *Open Advantage* products provide

CLIENT/SERVER COMPUTING: A SPREADING IMPACT

"Where does your organization stand with regard to client/server computing?"

(2,487 Sites Surveyed, Q1 1991)



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Sterling Software
Right-sizing for a Multi-Platform Environment

Sterling Software's view of client/server computing is specified in its Corporate Applications Management Initiative (CAMI). CAMI is a complete life cycle environment that enables the "right-sizing" of applications consistent with AD/Cycle and SAA—while embracing both IBM and non-IBM platforms.

Right-sizing, as defined by Sterling Software, means that the client portion of client/server applications for new or reengineered applications does not run on the mainframe. Data, however, may be located on the mainframe and supplied to the client by mainframe-resident servers or managed by SQL servers.

Sterling Software believes that the economics of LANs, workstations and minicomputers—and the increased utility of applications—make right-sizing an attractive option. However, corporations cannot ignore the fact that a majority of corporate data is located on its mainframes. This fact, combined with a heterogeneous computing environment, has led Sterling Software to develop multi-platform client/server solutions.

Currently supported client platforms for right-sizing include end user systems based on DOS, Windows, OS/2, Presentation Manager, LANs and UNIX, and departmental systems including Tandem Guardian and Informix. On the server side, Sterling supports data access from these client platforms to all mainframe databases, including DB2, IMS/DB, VSAM, SQL/DS, DL/1, ADABAS, IDMS and others.

For further information, contact:
Amy Ballou
Senior Marketing Manager
Sterling Software, Inc.
Answer Systems Division
5900 Canoga Avenue
Woodland Hills, CA 91367
818/716-1616, extension 273

Circle 600 on Reader Card

emulation of 3270 and remote job entry terminals for UNIX environments.

Servers can be mainframes, minicomputers, workstations or personal computers. Sun Microsystems, for instance, offers a server family based on a reduced instruction set computing (RISC) architecture and the UNIX operating system—called *SPARCserver*—that handles workgroups of 10 to 80 networked clients. The choice of server depends on system size and deployment as well as the kinds of functions servers will perform, the type of application environment in which they will run and an assessment of how the client/server system will need to evolve with the organization it serves.

PCs and workstations also function as clients. Sun Microsystems' *SPARCstation* line of clients ranges from the low-cost *SLC* model to high-end graphics workstations for image processing and scientific visualization. Even dumb terminals can be useful in a client/server environment. All manner of peripherals, too, can be linked via client/server-oriented LANs. Often, products from several vendors must perform together on one network.

Motorola's Commercial Systems Division, for example, markets the RISC/UNIX-based *MultiPersonal Computer (MPC)* family, which supports various workgroup sizes and can simultaneously act as a LAN server for installed PCs and Macintoshes.

What Servers Do

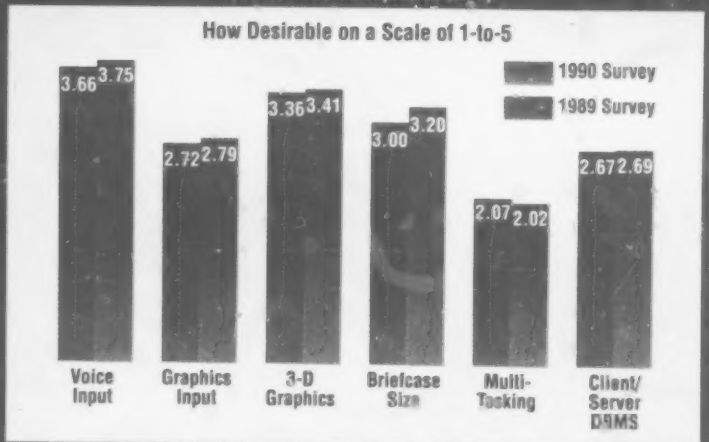
Indeed, BRG research indicates that peripheral sharing is the most common function of LAN servers. But it certainly isn't the only one. Servers also handle such activities as:

- File sharing
- Storage and retrieval, including electronic mail and voice mail store-and-forward
- Network and document management
- Gateway functions, including gateways to corporate and outside services and public electronic mail
- Batch processing

WHAT USERS WANT IN TOMORROW'S PCs: MULTITASKING, WINDOWS AND MORE

On a scale of 1 to 5 (1=Very, 5=Not at all), how desirable would you deem the following product features for your longer-term future PC usage?

(4,062 Sites Surveyed, Q3 1991)



- Remote management
- Software licensing
- Bulletin board
- Facsimile transmission sending and receiving
- Customer billback
- Videotext

As organizations adapt to client/server architectures, some are dedicating servers to specific functions, such as database management or electronic mail, often so departmental servers' capacity can be used to handle file sharing tasks.

Seeing the Data With Forest & Trees

"Like most firms, we have multiple databases," says Paul Capalbo, manager of systems development at Heidelberg Harris USA—a $300M division of Heidelberg Druksmachinen, the world's largest manufacturer of printing presses and related equipment.

"Providing access to each database requires supporting a separate gateway, and the management of each gateway product can become a real nightmare," says Capalbo. "We really needed to find a way around it."

"The product easily reads to any of our databases, including flat files, Btrieve, Oracle, and Total. With Forest & Trees, *providing access is simple, even over a network."*

The company has embarked on a distributed environment strategy to put data into the hands of end users via a common front-end client for applications accessing any database or other information source.

After evaluating several products, Heidelberg Harris purchased a 100-seat site license for *Forest & Trees* from Channel Computing, Inc.

"*Forest & Trees* addresses both our data access and front-end reporting needs," says Capalbo. "The product easily reads to any of our databases, including flat files, Btrieve, Oracle, and Total. With *Forest & Trees,* providing access is simple, even over a network."

"And the front-end reporting features allow us to easily customize user screens. It really is a quantum leap forward."

Heidelberg Harris has developed applications specifically designed to capitalize on *Forest & Trees'* data access and reporting capabilities.

One Heidelberg Harris program, 'Cop on the Block,' uses *Forest & Trees'* front-end capabilities to provide manufacturing managers with graphs that monitor individual workloads and order status throughout the manufacturing process. *Forest & Trees* accesses data from an Oracle database over a Novell network and must work in conjunction with an Omni5-based remote work assignment system.

'Financial Dashboard' accesses data from an IBM Platinum accounting system. Managers use a *Forest & Trees* front-end to review and analyze line item budgets. Icons created for financial indicators allow easy monitoring of the changing status of financial information.

Heidelberg Harris is so pleased with *Forest & Trees* that it is implementing it as the standard data access and reporting front-end on its 700-node, 32-server nationwide network.

ADVERTISEMENT

Channel Computing

From Data to Information

Channel Computing Inc. is a three-year-old, venture-funded company dedicated to making products that put data into and pull information from databases.

Channel's flagship product—*Forest & Trees*— is a widely praised data access and reporting tool that combines an easy-to-use, WYSIWYG, object-oriented report writer with access to data sources that extend from DB2, Oracle, Rdb, and SQL Server down to dBASE, 1-2-3 and Excel, with many others in between.

Forest & Trees goes beyond traditional report writers in important ways only recently made possible by emerging

new computer platforms and technologies like graphical user interfaces, local area networks and client/server databases. Tabular views of data are presented on an easy-to-use graphical desktop and automatically updated at user-specified intervals, turning the computer display into an electronic dashboard of business vital signs. Data can be presented in a spectrum of formats and colors. Because reports are delivered electronically as well as on paper, users can point and click on an item of interest and drill down to the lowest level of detail. Reports become living, up-to-date instruments that turn data into information.

Achieving immediate recognition, Forest & Trees was named one of *Datamation's* Top 100 Products of 1990, awarded *Infoworld's* Buyer's Assurance Seal of Approval and was nominated for Best New Idea in their annual readers' choice awards.

Forest & Trees is available for Microsoft Windows 3.0, Hewlett-Packard NewWave 3.0 and Microsoft DOS. It supports most major LANs including Novell NetWare, Microsoft LAN Manager and Banyan Vines. An OS/2 PM Version 2 edition of *Forest & Trees* will be available later this year.

Channel Computing can be reached at 603/659-2832.

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TechGnosis, Inc.
Creating Middleware

SequeLink Client/Server MiddleWare™ is a comprehensive set of client- and server-resident software modules that provide direct access to host-based data and services from within client applications. *SequeLink* delivers all the economic and productivity benefits of client/server systems, incorporating your computing standards.

As a result of more than five years' experience in delivering client/server solutions worldwide, TechGnosis has developed the *SequeLink MiddleWare* architecture. Unlike any other client/server solution on the market, this modular system allows you complete freedom in choosing your client applications, networking protocols, client and server environments and database management systems.

With *SequeLink* you can offload current host-based applications (or develop new applications) to run on low-cost desktop systems, taking full advantage of advanced graphic workstation environments and compatible development and decision support tools.

While the application runs on the client, the data remains on the host, ensuring the integrity and security of your organization's most precious resource—its information. *SequeLink* makes that information an integral part of your client applications, increasing productivity, reducing the time and effort needed to develop new applications, decreasing the workload on expensive host systems and lowering the cost of running your applications.

SequeLink is currently available for the following environments:

- Applications: Excel, Wingz, HyperCard, ToolBook, 4th Dimension, SmallTalk, Visual Basic, Power Builder, Lotus 1-2-3, Easel. A complete Application Programming Interface (API) is available on all platforms.
- Client environments: Macintosh, Microsoft Windows, Presentation Manager (OS/2), Sun SPARC, RS/6000, SCO UNIX, DEC Risc, HP/9000.
- Network protocols: TCP/IP, DECnet, NetBIOS, NetWare, APPC, AppleTalk.
- Server Environments: OS/2, Sun SPARC, RS/6000, Macintosh A/UX, AS/400, VAX, DEC Risc, SCO UNIX, HP/9000, MVS.
- DBMS engines: Oracle, Ingres, Sybase, Rdb, SQL Server, Informix, System 1032, AS/400 Relational Database, OS/2 EE Database Manager, DB2.

Site licensing is available. For more information, contact TechGnosis toll-free at 800/321-0543.

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strategic advantage, more than a few client/server system implementers refuse to discuss the specifics of their applications.

"Client/server applications are taking computing beyond task automation," comments Channel Computing's Sullivan. "Data is being made more accessible to the user. Client/server applications pull data off an old transaction system and put it on the network where users can analyze it, manipulate it, share it."

A New Age

The issues of client/server system deployment—the plans and the goals, the problems and the solutions of those accomplishing client/server computing—are not simple. Viewed separately, these matters can seem to be little more than the ephemeral fashions of high tech wizardry, glittering briefly before they disperse into the ebb and flow of larger, steadier currents.

But occasionally come moments of sea change. Client/server computing signals one such moment when apparently disparate trends, inclinations and technical possibilities coalesce into a new information systems age in which:

• *Organizations*—utilizing complex networks of hardware, software and services from multiple vendors—are able to provide productive team computing environments for groups of

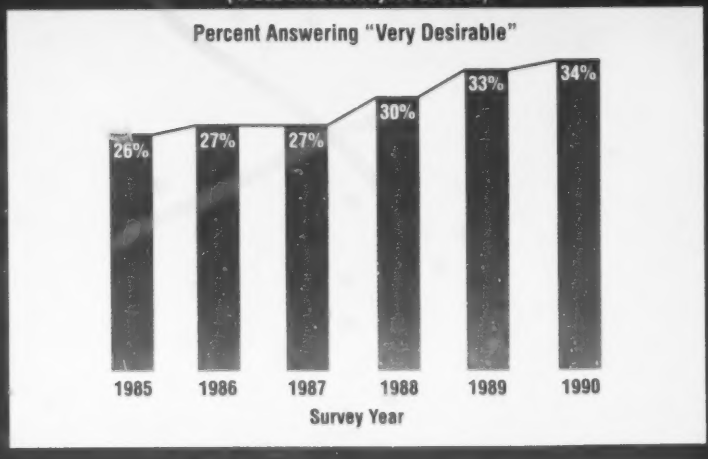
"OBJECT ORIENTED PROGRAMMING WILL PLAY AN INCREASINGLY IMPORTANT ROLE IN OUR INTERNALLY DEVELOPED C/S APPLICATIONS."

Responses of 100 Fortune 1000 MIS and End User Executives who are early adopters of Client/Server Computing

BUILDING INTEREST IN UNIX-LIKE CAPABILITIES FOR PCs

"How desirable would a multi-user operating system (e.g., UNIX) capability be to you for your PCs?"

(4, 062 Sites Surveyed, Q3 1991)



workers long isolated from each other. Because work is created and communicated with information systems, the knowledge of employees not only will be shared but preserved, ultimately expanding the knowledge base of the entire enterprise.

• *IS* benefits from vendors' compliance with a wide range of product standards that results in interchangeable, open systems. So applications are ported from machine to machine and system to system without difficulty and system configurations are scaled to meet the expansion, contraction and realignment of the organization's various elements without disrupting operations. Meanwhile, system management tools assure data integrity and handle day-to-day network and data management. Application development environments help reduce and even eliminate application development backlog through programming techniques emphasizing code re-use and, eventually, end user programming of simpler routines.

• *End users* hardly ever think about computers, even when they're programming them. That's because end users enjoy unparalleled ease of use and transparent access to both corporate and public information; the software tools they utilize to manipulate information are flexible and exploit natural language, straightforward images and expert systems. The machines on end users' desks, as well as the machines in their briefcases, allow them to undertake several tasks at once and engage an assortment of integrated media—including data, text, graphics, scanned image, sound and full-motion video—in the pursuit of greater efficiency, better ideas and new products and services.

Getting From Here to There

"In the 21st century," says Bill Joy, vice president of research and development at Sun Microsystems, "it will no longer be sufficient to put computers into environments. They must be part of the environment."

Exotic as it sounds, the rich potential of this new information systems age is already being actualized. Take note:

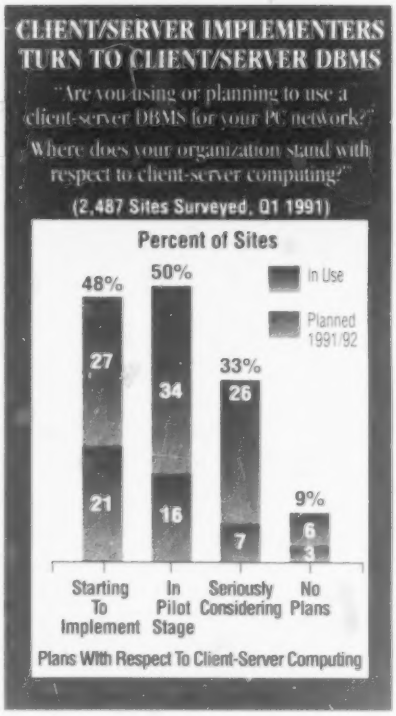
The Architectural Imperative

If the promise of client/server systems are to be realized, then it will be in the form of a new kind of computing architecture. This client/server architecture is incorporating several principles and capabilities, including:

• *Multitasking.* Over 90% of BRG survey respondents thought it important that servers be able to perform multiple functions simultaneously. Depending on the organization and the application, some client/server system builders may also need to deploy multitasking clients.

• *Multiple operating system integration.* It is not unusual for a single client/server system to be running several different operating systems at once. DOS, OS/2 and UNIX operating systems commonly appear on both clients and servers, and, as research by Cowen & Co. indicates, interest in UNIX-like capabilities for PCs has been building for several years as organizations develop multiuser, multitasking client/server systems of greater and greater power.

• *Portability.* Because client/servers systems encompass an assortment of hardware platforms, and because they often must be compatible with the implementer's existing information systems, it is vital that the application software used in a client/server system can be ported to different hardware platforms from multiple vendors.



• *Scalability.* Even more critical to many organizations implementing client/server computing is the assurance that their hardware can be upgraded without affecting software performance. This allows uninterrupted system growth and gives organizations the ability to tailor their systems to changing times and needs. It makes eminent sense, therefore, that BRG found scalability to be a key client/server purchase criteria for the vast majority of the Fortune 1000 executives it surveyed.

• *Application development productivity.* As client/server systems take their place alongside mainframe and minicomputer installations, often interacting with these older systems and relieving them of many end user computing burdens, IS departments are finding that PC/LAN-based application development can be faster and therefore more

productive than application development for traditional mainframe and minicomputer environments.

"With client/server computing, organizations have the latest graphic, workstation-based decision support and application development tools available to build systems that until now had to reside where the data resided," TechGnosis' Toleman declares.

Among the challenges facing application developers is the need to build client/server applications that are compatible with existing mainframe systems. Sterling Software's *Corporate Applications Management Initiative (CAMI)* offers a complete life cycle

Synchrony Updates Travelers Fast

"It was taking several weeks for updates to be reflected in field office contracts and that just wasn't acceptable," recalls Barry Edmonds, systems director at The Travelers Insurance Company, Hartford, CT.

Several years ago, The Travelers' information systems group designed a client/server-based 'contracts analysts workstation' to automate the production of its benefits booklets.

A critical component of the application is the generic-text paragraphs generated by the legal department for incorporation into the booklets. The paragraphs are regularly updated and, for liability reasons, it is imperative that the contract analysts work with the most recent updates.

"It frees up a lot of memory on the workstations."

"We tried to use the corporate e-mail system to distribute the updates, but it didn't work very well. Users had to log on to the system correctly and even if that was done we still had no way to verify that the files were properly installed."

The question was: how to synchronize the updates to the application? For the answer, The Travelers turned to the *Synchrony* software distribution management system from Telepartner International, Farmington, CT.

Initially, The Travelers used *Synchrony* for overnight automatic transmission and installation of up to 140 file updates on 138 contract analyst workstations.

"Today we use *Synchrony's* file server update," says Edmonds. "With access to the server, we only have to send the contract updates to our five servers. It frees up a lot of memory on the workstations."

Synchrony's distribution list system made the switch simple.

"The systems administrator just lists the names of the locations. It doesn't matter whether you designate one or 150 locations or whether those locations are client or server. Everything is verified and it's fast."

In addition to file maintenance, Edmonds' group has put *Synchrony* to work delivering software program changes and answering maintenance requests.

"We are actually delivering updates of the contract analyst workstation system software using *Synchrony*. I wouldn't have even tried that before," he says. "I don't think another product could do what *Synchrony* has done for us."

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Managing Distributed Applications

The demanding requirements of workgroup and enterprise applications has helped drive the development of more powerful machines and the definition of a new application architecture, client/server computing. These technical advances, in turn, made possible the implementation of increasingly sophisticated distributed applications that improve the way companies sell, serve customers, manage inventories, control costs and make decisions.

A key requirement for mission-critical client/server systems is effective application management. Managing application deployment and maintenance to ensure availability and integrity, while controlling associated costs, becomes a real challenge. Now there is software designed and built from the outset for flexible, reliable, highly integrated distributed application management: *Synchrony*.

Synchrony automates the entire process of managing the deployment and maintenance of distributed applications. It delivers and installs software. It rolls back software changes. It distributes data and text. It collects data for backup or consolidated reporting. *Synchrony* does all of this interactively, or on a scheduled, unattended basis with almost no involvement from the end user. For unattended updates, the user simply makes a menu selection from *Synchrony's* Workstation client. *Synchrony* does the rest automatically.

Synchrony's Administrator client provides a complete set of integrated tools for assembling components of a distribution and packaging them for delivery and installation; creating and maintaining distribution lists; and scheduling and monitoring the status of distributions and retrievals. *Synchrony's* server, the Communications Manager, installs thousands of updates overnight with a high level of performance and reliability for direct, dial-up or LAN connections using existing networks and staff.

Synchrony's field-proven technology is used in demanding distributed computing environments to keep applications up to date and 'in sync.' Available today, *Synchrony* is the choice of companies for managing the distributed applications that are driving their business success in the 1990s.

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development environment that produces applications consistent with IBM's AD/Cycle and SAA strategies embracing both IBM and non-IBM platforms.

Some newer programming techniques—particularly object-oriented programming, which enables the development of reusable code and the creation of reusable code libraries—will make new application development more productive still. Although many organizations are concerned about the need to retrain IS staff to deal with the demands of client/server computing, even more of those BRG interviewed plan a growing role for object-oriented programming in their internally developed client/server applications.

"Current object-oriented products require new ways of thinking, different programming techniques, and that will take time to achieve," says Dennis McEvoy, president and CEO of Cooperative Solutions. "But users would love to have the benefits of object-oriented programming like re-usable application components."

Easel Corp.'s vice president of marketing, Steve Sayre, agrees. "Object-oriented programming is important to client/server computing," he says. "It's compelling to IS because maintenance is such a burden and new application development is pursued in most organizations by only a few people."

And eventually end users themselves will become involved in application development.

"As client/server computing evolves," says Sayre, "we'll see more applications being developed at the department and even the desktop level, so applications will be increasingly business- and enterprise-oriented."

The Inevitability of Open Systems

There is no inherent interdependence between client/server computing and open systems, but since many organizations require that new client/server systems be compatible and interoperable with existing applications and hardware so investments in present systems, applications and trained personnel are not squandered, open standards-based client/server system configurations have obvious appeal.

"The theory behind openness is that all technology can benefit from improvement and that all customers benefit from such innovation," notes Scott McNealy, president and CEO of Sun Microsystems. "The fundamental premise in defining openness is a positive answer to a simple question: Can this technology benefit from innovation, from being faster, more full-function and cheaper?"

It is not surprising that more than half of those surveyed by BRG last year cited compliance with open system standards as an essential client/server purchase criterion.

"Customers want to be able to mix and match IS products, utilizing their resources the way they see fit to get the job done," says Ken Dixon, vice president and head of the Synchrony business group at Telepartner International.

Client/Server DBMS: A Key to the Kingdom

One of the cornerstone standards in client/server computing is relational database management software with Structured Query Language (SQL), which assures data

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environments—for instance, adding or deleting data from one set of tables will not contaminate data residing elsewhere on the server—and thus enables development of mission-critical client/ server applications.

Using SQL as a *de facto* standard, vendors are re-designing their DBMS products to perform in client/server environments; usually, the DBMS and data reside in a server, while application logic and control are located in the clients. Crucial to a client/server DBMS' effectiveness is its ease of use and its ability to share processes and data and exchange information on the network.

Today's client/server DBMS products often support relational functionality and database semantics and are increasingly object-oriented. Some enable an application to connect to multiple database servers, thus providing end users with access to a broad range of information.

For example, Sterling Software's *Answer* products—including *Answer/Server, Answer/SQL, Presentation/ Answer* and *Micro/Answer II*—allow end users to access and download mainframe files to PCs and workstations from multiple vendors. *Answer* products can be used with numerous DBMS offerings and do not require that end users know where or how data is stored.

It is understandable, then, that 80% of the Fortune 1000 IS and end user executives BRG talked to said they are or will be developing applications in-house using a client/server database. And Cowen & Co. research shows that the more involved in client/server computing an organization is, the more likely it is to be using or planning to use a client/server DBMS.

"The DBMS is one of the building block components of the client/server environment, and it will become even more important in the future," maintains Fred Braddock, vice president of research and development at Sterling Software. "Issues of data integrity and security come into play at the level of data extraction and data update, so system security and data integrity matters reside with the DBMS."

Hence those putting client/server DBMSs to work seek products with some necessary data integrity features, including:

- Full database administration and security utilities,
- Stable transaction throughput via space management techniques and specialized input/output handling,
- Data access optimization,
- Automatic locking of records and rollback of partially completed transactions, and
- Recovery of completed transactions in case of system failure.

"IS is held to a much higher standard of performance than any other group in an organization," says John LePere, director of product planning at Global Software. "So IS needs to be sensitive to how data is used and IS wants tools that protect the information assets of the company."

Graphical User Interfaces and Beyond

Graphical user interfaces (GUIs)—those operating environments that act as an interface between the end user, applications and the underlying operating system—are what makes a computer easy to use. Because the same GUI can act as a client front-end for all applications on a client/server system, end users deal with the same screens, menus and methods as they learn and use all software applications, thus reducing training

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Cooperative Solutions

Client/Server Transaction Processing

Cooperative Solutions' *ellipse* is the first software product designed specifically for developing, deploying and managing on-line transaction processing (OLTP) applications that take full advantage of client/server platforms.

ellipse enables client/server transaction processing (CSTP) applications to combine the reliability of mainframe environments with the flexibility, price/performance and ease-of-use of PC/LAN client/server architectures.

The ellipse Production System (ellipse/PS) enables applications to meet the stringent requirements for traditional

OLTP applications as well as the new requirements for CSTP applications. As the first client/server management system, *ellipse/PS* is responsible for robust, predictable, consistent transaction processing. It automatically provides application and data integrity, systems availability, distributed transaction management, recovery from errors, performance optimization and application partitioning between the client and server. No further programming is required.

ellipse/PS is designed to operate in a variety of client/server environments. Customers' applications are independent of the particular DBMS, presentation service, communication and even operating system. It ensures portability of all *ellipse*-based applications with no additional programming.

Producing robust, reliable and easy-to-use applications have been difficult (most say impossible) without experienced systems-level programmers. The Ellipse Development Environment *(ellipse/DE)* changes this.

Project teams use *ellipse/DE* to develop, test and maintain CSTP applications. *ellipse/DE* is designed to leverage the experience of programmers who need not learn the C language or new concepts such as application partitioning, event-loop programming or distributed transaction management.

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time and expense, boosting productivity and heightening job satisfaction.

For GUIs to fulfill their promise, users and vendors must choose one or a few standard GUIs so that software products can be designed to work with them. These choices are being made in the marketplace now as major operating systems and GUIs are paired: the Windows GUI will serve the DOS software community, OS/2 products will be designed for Presentation Manager, UNIX systems will opt for OPEN LOOK or OSF/Motif. Terminals, meanwhile, will use the X-Windows GUI.

So, although just 31% of the 100 early adopters of client/server computing BRG surveyed have included a GUI with their client/server applications, as the decisions of the marketplace take root, more and more client/server computing implementers will deploy GUIs on their systems.

Already GUI-oriented development tools are available to make such efforts easier. Easel Corp.'s OS/2-based *Easel Workbench*, for instance, integrates a suite of visual programming tools, code-generation capabilities and an incremental compiler to help developers turn out graphical applications.

The next step involves integrating text, graphics and images—the beginnings of true multimedia capability that will ultimately include sound and full-motion video, too. For those building client/server systems, this is not as blue-sky as it appears: over 75% of the Fortune 1000 IS and end user executives queried by BRG thought text/graphics/image integration was an important aspect of their client/server strategies.

Applications New and Used

BRG reports that for some builders of client/server systems, a lack of interoperability between client and server is inhibiting application development. This may account in part for why 58% of those BRG interviewed are rewriting previously existing applications rather than creating new ones for their client/server deployments.

"The greatest challenge facing those implementing client/server computing is the state of the data," asserts Sullivan of Channel Computing. "The vast majority of data is not understandable, since everything is stored in code. If a company has not

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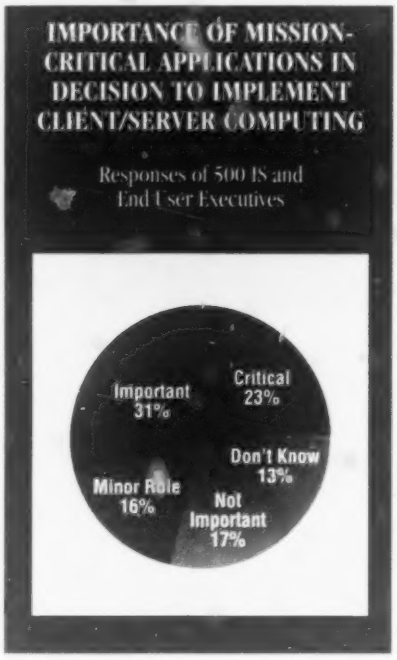
IMPORTANCE OF MISSION-CRITICAL APPLICATIONS IN DECISION TO IMPLEMENT CLIENT/SERVER COMPUTING
Responses of 500 IS and End User Executives
Important 31%
Critical 23%
Don't Know 13%
Minor Role 16%
Not Important 17%

thought through its data structure, if the data is meaningless in relation to business problems and solutions, then front-end tools become meaningless."

Although user organizations must conduct their individual struggles with data structure, software products developed especially for client/server application environments address interoperability problems. As these client/server front-ends come to market, those developing and using client/server systems will no longer struggle with interoperability problems and will be able to exploit client/ server computing's full potential for improving organizational productivity.

Among the many new kinds of software emerging for use on client/server systems are:

• Application data access and monitoring tools. Workgroups linked by client/server systems can be more productive if their managers can collect, combine and automatically track information from the applications, database files and database servers used. Channel Computing's SQL-based *Forest & Trees*, for instance, gathers and summarizes information from a wide range of PC/LAN sources, including spreadsheets, database files and database servers, presenting information in user-defined 'views.'

• "Middleware" tools. Since client/server implementations often incorporate several vendors' disparate software and hardware products, some of it not designed for a client/server configuration, "middleware" is sometimes needed to enable applications to work independently of data, location and system structure. *SequeLink*, a workstation/host DBMS connectivity tool from TechGnosis, can shield users from network and DBMS variables, and *SequeLink Engine* allows access to nonrelational host-based data and services.

• Software and data management tools. As applications are implemented on client/server systems, software and data must be distributed and maintained in ways that are cost-effective and ensure data integrity and availability. *Synchrony* from Telepartners International, for example, delivers, installs and retrieves PC/LAN program and data files; *Synchrony* will run unattended, scheduling and monitoring the status of distributions and retrievals.

• Client/server application development tools and languages. Although some discover that their client/server configurations can be nearly as expensive to operate as mainframe systems, new client/server development environments are a source of client/server cost benefits because they enable client/server application development in less time than a comparable mainframe application.

Ellipse from San Jose, CA-based Cooperative Solutions, for instance, enables the development of client/server-oriented on-line transaction processing applications for DOS and OS/2 environments; *Ellipse* works with existing data and applications and functions independently of operating system, communication method, DBMS, GUI and transaction manager. A UNIX version of *Ellipse* for Sun Microsystem platforms will be available early in 1992.

Some providers of mainframe software understand the need for interoperability with client/server systems and are responding with the necessary bridges. One such software vendor is Global Software, which sells business application software for IBM mainframes. Global's *Harmonix* cooperative processing products for accounting applications moves the processing and interface parts of the application to the PC while the mainframe continues to oversee data integrity and security.

Support from the Vendors

In an open systems world in which client/server computing is becoming increasingly prominent as a way for organizations to stay productive and competitive, the quality of a vendor's products and customer support will be a primary way it is differentiated from others. This will, of course, serve to improve support, for those vendors lacking it will lose their customers to those who provide it.

"Customer service, in terms of technical support and general training, will increase in importance to users during the 1990s," believes Warren Blossom, vice president of marketing at Motorola's Commercial Systems Division. "This will be especially true as users build multivendor networks, because they have the freedom to choose vendors

that not only offer the most suitable product for their applications, but the most attractive service as well."

Mission: Critical

Users are looking for three things from client/server computing," says McEvoy of Cooperative Solutions. "First, they want aggressive price/performance. They know that price/performance of PCs, workstations and servers is increasing by 50% a year."

"Next, they want the ability to deploy more functionality. They're learning the client/server architectures require less training for end users while providing increased access to more data. And, lastly, users want help reducing application development time."

As these end user and IS interests, needs and concerns are met by client/server computing, organizations will increasingly turn to client/server systems for enterprisewide, mission-critical applications.

Indeed, mission-critical client/server computing is already happening: BRG has found that 44% of the Fortune 1000 IS and end user executives it surveyed have built or are planning client/server systems that run mission-critical applications; of these, 44% are new applications, 38% are re-implemented and 18% are planned but not yet launched.

Many of those implementing mission-critical client/server systems are planning not application-by-application, but for the entire enterprise.

Still, much of today's enterprisewide computing—client/server-based or otherwise—is strategy rather than implementation. But in notable ways, that does not make it any less real. For those implementers and planners who choose to ponder how to accomplish enterprisewide computing are actually engaged in a vital process: they are rethinking the enterprise itself—how it will compete and succeed in the global economy of the 21st century.

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